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Australian mycophagous species of the genus *Deplorothrips* (Thysanoptera, Phlaeothripinae)

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Abstract

The genus *Deplorothrips* Mound & Walker is recorded from Australia for the first time. The genus is found widely across the continent, and descriptions and an illustrated identification key are provided to 14 new species. These have been found living on dead twigs and branches, particularly of *Eucalyptus* trees. Typical members of this genus have short maxillary stylets that are scarcely retracted into the head capsule, but some of the species have more deeply retracted stylets. Structural polymorphism is recorded in several species, associated both with sex and with body size. Remarkable variation is recorded for some species in the number of sense cones on the antennal segments.

Key words: maxillary stylets, sense cones, variation, polymorphism

Introduction

The genus *Deplorothrips* has not previously been reported from Australia, although species of this genus are common and widespread across this continent feeding on the fungi associated with dead branches. The main reason for this failure to report the presence of such common insects is that distinguishing species within *Deplorothrips* continues to be unusually difficult, due to complex patterns of variation in several characters within and between populations. As discussed further below, the variable characters involved include some that are used at times for diagnosing genera of Phlaeothripinae, such as the numbers of antennal sense cones, the form of the terminal antennal segments, the retracted position of the maxillary stylets within the head, the extent of sculpture on the head and thorax, the presence and shape of male sternal pore plates, and details of the colour of the body and tibiae. A further problem is that although some species are here recorded as widespread in eastern Australia, it is not unusual to find more than one species within any particular area, although not within single samples at individual localities. Extreme examples of more than one species being found in the same general area are the records given here from two small islands in the Pacific Ocean, with three *Deplorothrips* species from Lord Howe Island, and four from Norfolk Island. These records from small islands are particularly interesting because the thrips fauna of such places largely comprises introduced species (Mound & Wells 2015). The genus *Deplorothrips* thus poses complex ecological as well as taxonomic problems, to which this contribution is a basic introduction.

Deplorothrips was erected by Mound & Walker (1986) for a species of fungus-feeding thrips that is common on dead branches in New Zealand. Only one species was named at that time but, subsequently, Okajima (1989) described six species from Southeast Asia (Thailand, Malaysia, Taiwan and Philippines), and then (2006) two further species from southern Japan (Ryukyu Islands) (ThripsWiki 2016). The genus is presumably related to the two species-rich worldwide genera of fungus-feeding Phlaeothripinae, *Hoplothrips* and *Hoplandrothrips*, among which similar patterns of intra-population variation are well documented. Several species of *Deplorothrips* exhibit sexual dimorphism, as well as structural differences between fully-winged and micropterous (or apterous) individuals, and allometry in both sexes in association with body size. The patterns of variation within and between populations of *Deplorothrips bassus* proved to be such that Mound and Walker (1986) decided that it was not

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possible to determine how many species could sensibly be recognised amongst the 200 slide-mounted specimens available to them from New Zealand. In particular, the number of sense cones on antennal segments III and IV varies within some populations, and similar variation is reported here among some Australian species, based on a study of over 400 slide-mounted specimens. In contrast, fungus-feeding species in the northern hemisphere, in related genera such as *Acanthothrips*, *Hoplandrothrips*, *Hoplothrips* and *Phlaeothrips*, are not reported as exhibiting such variation in sense cone number, despite the very large number of slide-mounted specimens accumulated over many decades on which the most recent taxonomic account was based (Mound *et al*. 1976).

Depositaries and abbreviations. The holotypes of each of the new species described below are deposited in the Australian National Insect Collection, CSIRO, Canberra, with paratypes in the Queensland Primary Industries Insect Collection (QDPC), Brisbane. The following abbreviations are used for major setae: on head, po—postocular; on pronotum, am—anteromarginal, aa—anteroangular, ml—midlateral, epim—epimeral, pa—posteroangular.

Deplorothrips Mound & Walker

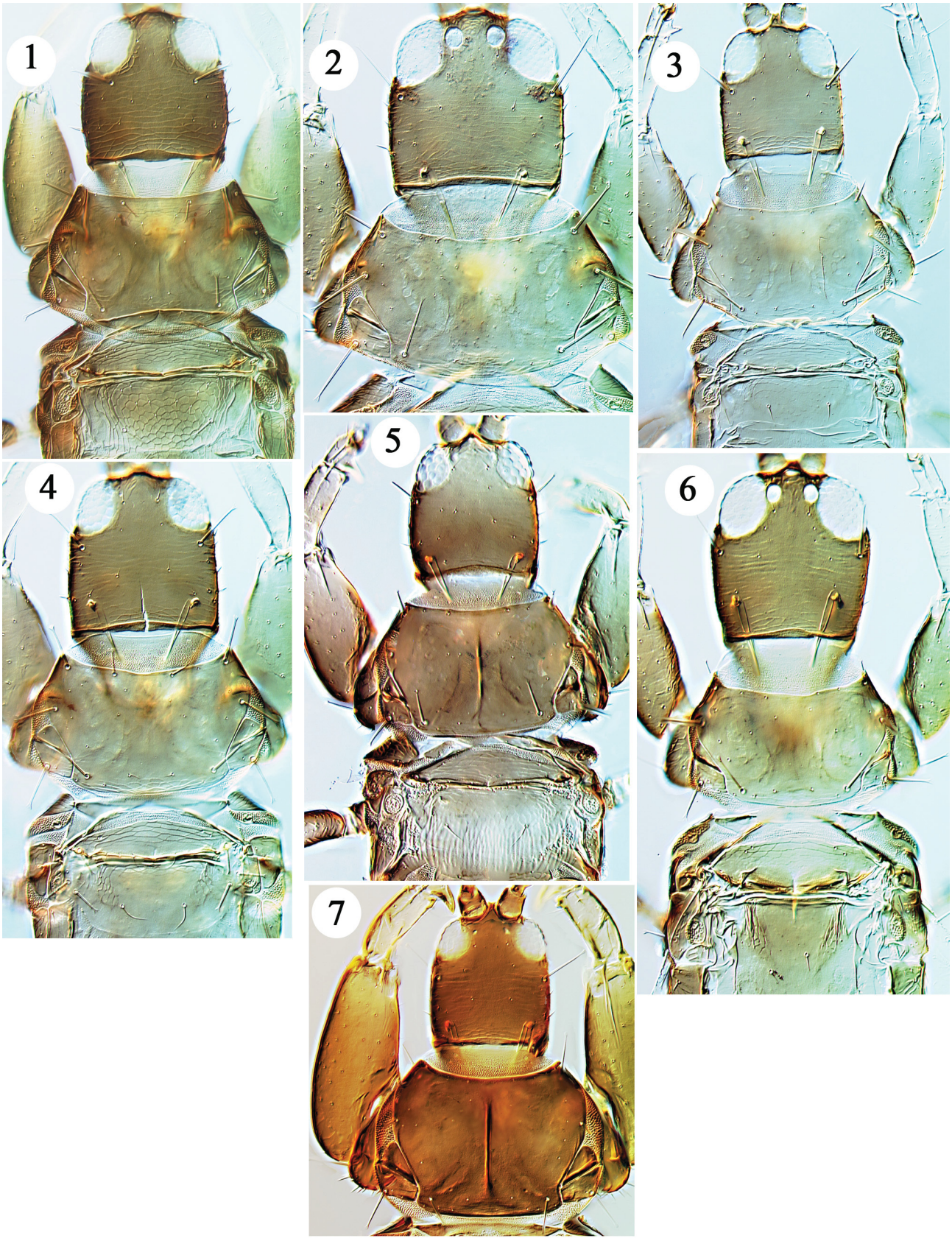
Deplorothrips Mound & Walker, 1986: 49. Type species *D. bassus* Mound & Walker

The pattern of character states exhibited by the new species described below is interpreted as indicating that these species represent a single lineage that has radiated within Australia. These species, with two exceptions, conform satisfactorily to the original generic diagnosis of *Deplorothrips*, as well as the diagnosis published by Okajima (2006). However, there is remarkable variation in many character states between some of the species. Rather than produce another long and confusing generic diagnosis noting the many differences in particular character states, variation in each of the major characters is here discussed individually. In considering this variation, it must be stressed that there is often a lack of correlation between the various states, such as maxillary stylet retraction and form of antennal segment VIII. This lineage of Australian and eastern Asian species that is designated the genus *Deplorothrips* is presumably derived from within the "*Phlaeothrips*-lineage" (sensu Mound & Marullo 1996) and is most closely related to the genus *Hoplothrips*. The maxillary stylets in *Deplorothrips* species are wide apart in the head, and in most species are less retracted into the head capsule than most Phlaeothripinae. Species of *Hoplothrips* and related genera including *Acanthothrips*, *Hoplandrothrips* and *Phlaeothrips*, all have the stylets deeply retracted, at least to the level of the postocular setae, and close together medially almost for the full length of the head (see figures in Mound & Walker 1986; Mound & Tree 2013). One exception to this generalisation is the minute North American species, *Hoplothrips smithi*, in which the stylets are short and low in the head, but in the absence of any modern account of the New World species of fungus-feeding Phlaeothripinae it is not possible to comment on the relationships of this species.

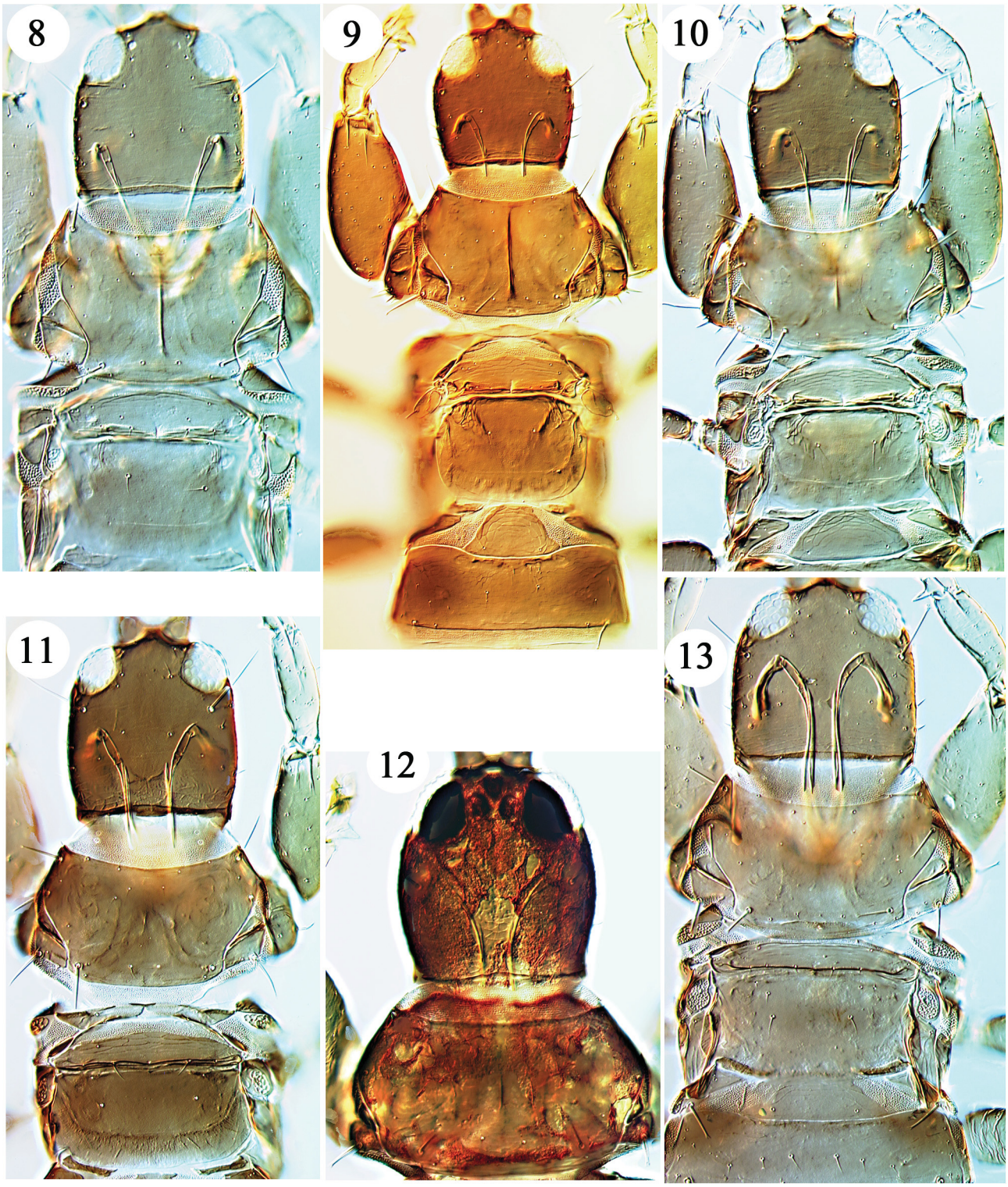
Character state variation. *Body colour*: Most species are medium to light brown with red internal pigments. The hind tibiae are clear yellow in many species, but light brown, or at least washed with brown, in some of the most common species in Australia. The antennal segments are generally brown with III paler in most species, although segment III is clear yellow in a few species, and most of the specimens in the *bassus*-complex from New Zealand have antennal segment III brown. The major body setae are consistently pale on all of the species considered here, with the exception of *retis*.

Antennal segmentation: Eight segments are present in all species, with segment VIII usually broadly based (almost fused to VII in two species from southern Japan), but narrowed to the base in two species described below, and in one of these almost lanceolate (Figs 20–32).

Antennal sense cones: Segment III bears either 1, 2 or 3 sense cones (=*sensilla basiconica*), whereas IV bears 2, 3 or 4. In some species the macropterae bear more and larger sense cones than micropterae or apterae, and in one of these species macropterae have numerous small sensory hairs (=*sensilla trichodea*) ventrally on segments IV–VI (Fig. 20). A remarkable variant is the presence on some specimens at the inner apex of segment IV of either two small sense cones or of one large sense cone, and bilateral asymmetry in this occurs in some individuals. Sense cones occasionally fall off during slide preparation, and it is essential to look for the basal pores of these structures to determine their presence or absence. Variation in the number of sense cones on antennal segment IV is also known to occur in the widespread predator, *Karnyothrips flavipes* (see Okajima 2006).



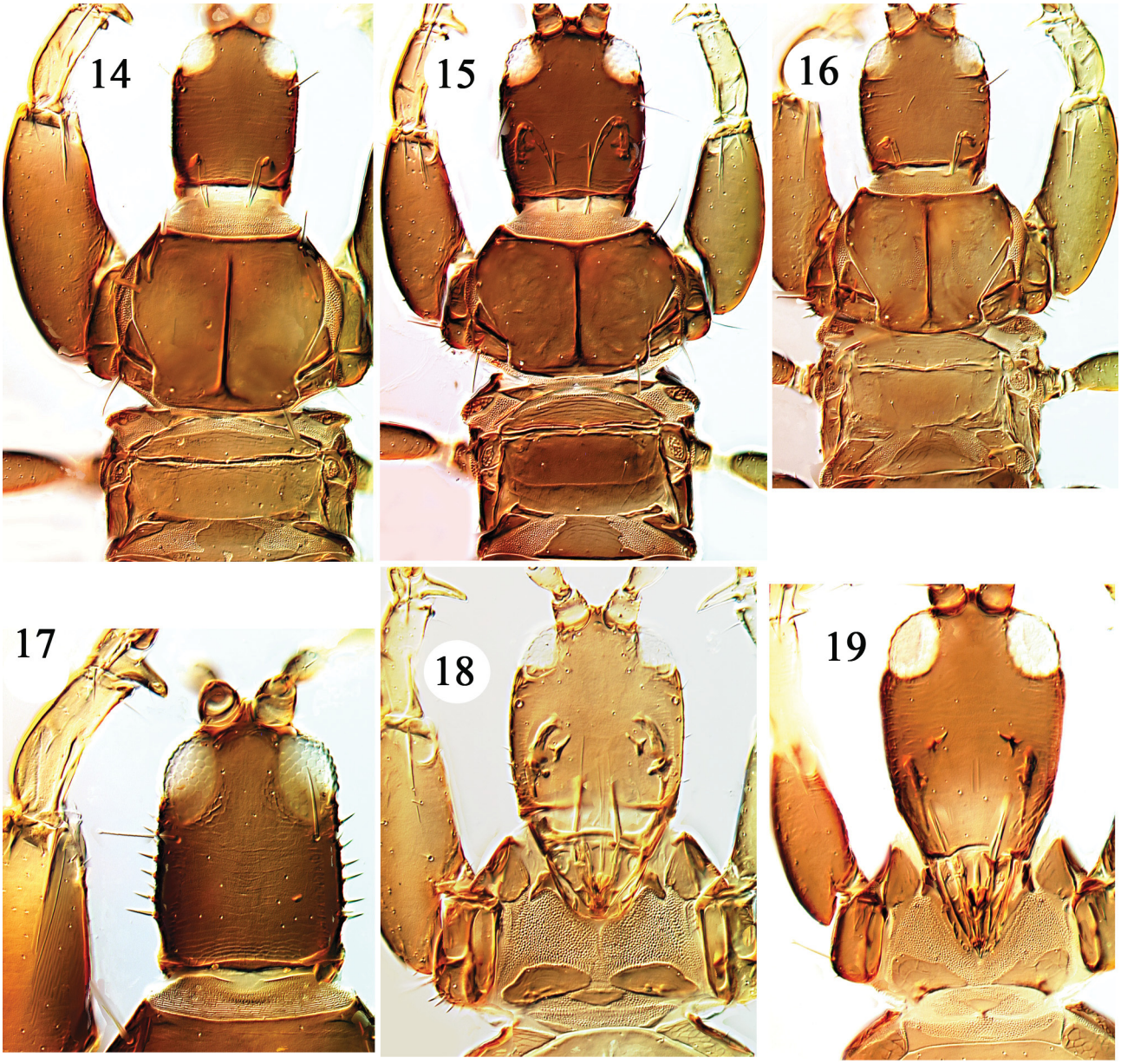
FIGURES 1–7. *Deplorothrips* species, head and thorax. **(1)** *villosus* holotype; **(2)** *diaphorus* female macroptera; **(3)** *paspalus* holotype**; (4)** *regina* holotype; **(5)** *virgulatus* male paratype; **(6)** *makrus* female macroptera; **(7)** *norfuki* holotype.



FIGURES 8–13. *Deplorothrips* species, head and thorax. **(8)** *chydaeus* female; **(9)** *capitalis* holotype**; (10)** *howei* holotype; **(11)** *minaei* female; **(12)** *retis* holotype; **(13)** *deuae* female.

Head cheek setae: The typical condition involves one or two pairs of rather weak cheek setae (Figs 1–7), but major males can have several pairs with some setae considerably stouter (Fig. 17). In a few species the cheek setae are weak and scarcely apparent.

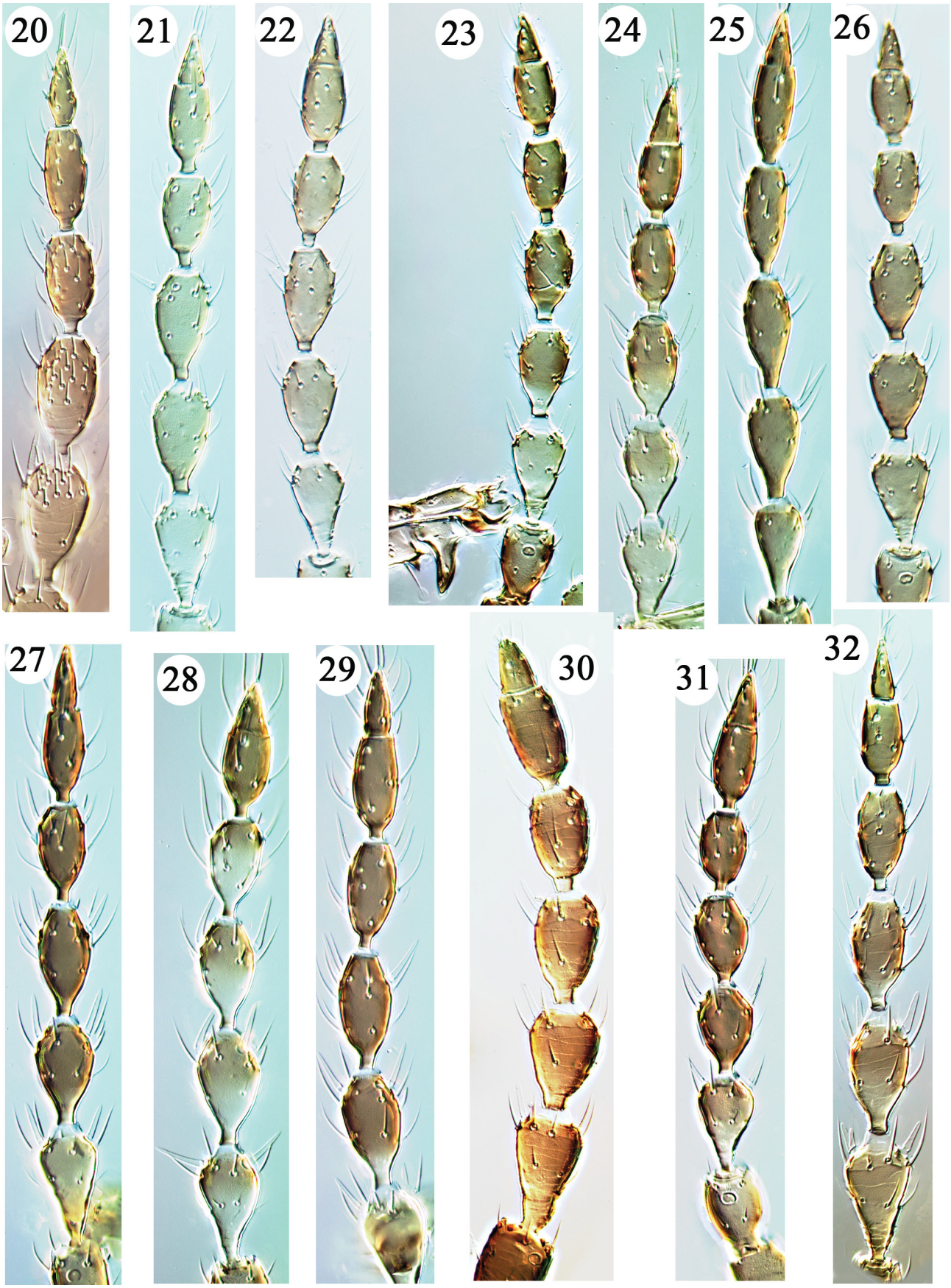
Mouth cone length: The mouth cone is usually short and rounded, but in a few species it is pointed and longer, extending beyond the fore coxae (Figs 18–19).



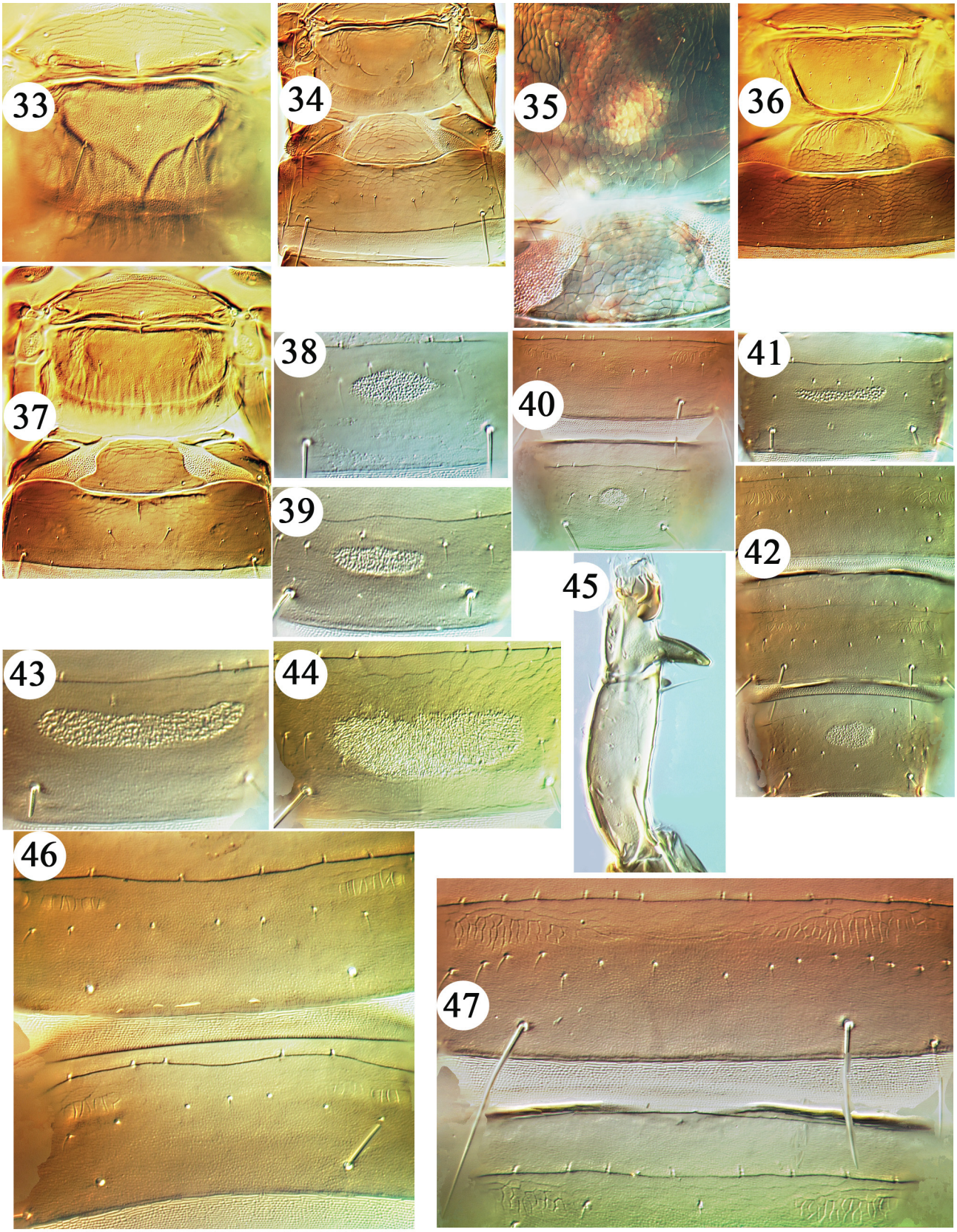
FIGURES 14–19. *Deplorothrips* species, head and thorax. Large males 14–17: **(14)** *makrus* holotype; **(15)** *minaei* holotype; **(16)** *mongai* holotype; **(17)** *villosus*. Prosternum 18–19: **(18)** *deuae* (holotype); **(19)** *makrus*.

Maxillary stylet position: Although low in the head in typical *Deplorothrips* species (Okajima 2006), there is considerable variation. The images of heads (Figs 1–13) are here presented in the order of increasing stylet retraction. This emphasises that there is a progression from stylets not retracted anterior to the occipital ridge, to stylets retracted to the level of the postocular setae, with no clear distinction between the various conditions. The maxillary levers, articulating at the anterior end of the straight and rigid maxillary pillars, are commonly orientated in Phlaeothripinae along the longitudinal axis of the head (Fig. 9 in Heming 1993). Among *Deplorothrips* species, this condition is found only in *retis* **sp.n.**, a species that, as discussed below, is only weakly related to the other members of the genus. In most species of *Deplorothrips* the levers are orientated at an angle toward the mid-line (Fig. 13), and in many species they are also not in a horizontal plane but are directed dorsally and thus appear fore-shortened (Figs 1–7). Slide-mounting procedures often result in the stylets becoming disrupted, and in such specimens it may not be possible to predict the natural retracted condition. When seriously disrupted, the levers may be orientated almost transversely or even directed posteriorly, and the stylets are not straight but slightly wavy.

Fore tarsal tooth: This is present in both sexes, although varying greatly in size and shape. In some individuals it is short and sharply pointed, but in large males it is bluntly pointed and at least as long as the fore tarsal width.



FIGURES 20–32. *Deplorothrips* species, antennae. **(20)** *diaphorus*, macroptera, segments IV–VIII ventral; **(21)** *chydaeus*; **(22)** *deuae* (holotype); **(23)** *howei*; **(24)** *makrus*; **(25)** *minaei*; **(26)** *mongai*; **(27)** *norfuki*; **(28)** *paspalus*; **(29)** *regina*; **(30)** *retis*; **(31)** *virgulatus*; **(32)** *villosus*.



FIGURES 33–47. *Deplorothrips* species, metanotum and male sternites. **(33)** *howei*, large male, meso and metanotum. **(34)** *regina*, metanotum and tergites I–II. **(35)** *retis*, metanotum and pelta. **(36)** *villosus*, large male, metanotum and tergites I–II. **(37)** *norfuki*, holotype metanotum and tergites I–II. Male sternite VIII pore plate 38–44: **(38)** *chydaeus*; **(39)** *deuae*; **(40)** *diaphorus*; **(41)** *howei*; **(42)** *makrus*; **(43)** *mongai*; **(44)** *villosus*. **(45)** *howei*, male fore tarsus & tibia. Male sternites V–VI 46–47: **(46)** *capitalis*; **(47)** *diaphorus*.

Male fore tibia: The inner apex bears a small tubercle in males of most species, but this tubercle is larger in major males than in small males (Figs 23, 45).

Pronotum: Although transverse in females, the pronotum of large males is more elongate with a stout longitudinal median apodeme (Figs 14–16). The notopleural sutures are almost always complete.

Pronotal setae: Four pairs of major setae are always developed and capitate, but the am setae are usually acute and no larger than discal setae in both sexes. However, in females of a few species the am setae are capitate although rarely more than half as long as the aa setae (Figs 1, 4).

Thoracic sternites: Prosternal basantra are not present in any species, and the ferna are transverse and often almost meeting in the midline (Figs 18–19). The mesopraesternum is sometimes transverse in macropterae, but is eroded in most individuals to a pair of small lateral sclerites. Metathoracic sterno-pleural sutures are present in all individuals.

Metanotum: In most species of the genus, whether macropterous or apterous, the metanotum lacks sculpture, although in two species it is reticulate (Figs 1, 36), and in a few species the posterior area of the metanotum of large males bears curious longitudinal sculpture (Figs 5, 33, 37). In one species, the metanotum bears many small setae.

Fore wing condition: Macropterae are generally uncommon in this genus, but when present the fore wings are almost parallel sided, and bear no more than 12 duplicated cilia. Apterae usually have no indication of a wing lobe, but apterae in a few species have a minute round lobe about 5 microns in diameter, and micropterae of some species have the wing lobe less than 25 microns long. These small lobes sometimes bear one or two setae. There is thus no simple distinction between winged and wingless conditions. Moreover, although micropterae and apterae usually lack ocelli, some such specimens have paired ocelli, or even just one, weakly developed posterior ocellus.

Pelta: The shape of the first abdominal tergite is rather indeterminate in the species considered here. In a few macropterae it approaches a typical *Hoplandrothrips* condition (Mound & Tree 2013), but in most individuals it is shorter and broader, ranging from sub-quadrate to D-shaped, and often with the anterolateral margins partially eroded (Figs 9–10; 14–16).

Tergite IX setae: Setal pairs S1 and S2 are capitate and shorter than the tube in most species, sometimes no longer than the basal width of the tube. However, in one species they are pointed and longer than the tube. The accessory setal pair between S1 and S2 is usually long (Dang *et al*. 2013).

Tergal wing-retaining setae: The typical two pairs of sigmoid setae are present in all species studied, but although they are large and sigmoid in macropterae, they are short, straight and acute in micropterae and apterae.

Male sternites III–VI: The largest males of some species usually have transverse rows of specialised reticulation anterolaterally on these sternites (Figs 42, 46, 47); these are presumably associated with glandular tissues (Okajima 2006). Small males of the same species usually lack these structures.

Male sternite VIII: Typically the males in this genus have a small pore plate, but this varies in shape between species from small and oval to slender and transverse, although in one species it is broadly transverse (Figs 38–44), and males of one species lack any pore plate.

Key to species of *Deplorothrips* from Australia

1. Metanotum with more than one pair of setae medially (Figs 1, 36); male sternite VIII with broad pore plate (Fig. 44). . . . . ***villosus* sp.n.**
-. Metanotum with one pair of setae medially (Figs 3–5; 33–35); male sternite VIII with pore plate smaller or absent 2
2. Head anterior margin yellow to light brown between the eyes (Fig. 5); metanotum longitudinally sculptured; male with no pore plate . . . . . ***virgulatus* sp.n.**
-. Head uniformly brown; metanotum either reticulate or with no sculpture between the major setal pair; males, where known, with small pore plate on sternite VIII 3
3. Metanotum strongly reticulate (Fig. 35); male with narrow pore plate extending fully across sternite VIII to lateral margins . . . . . ***retis* sp.n.**
-. Metanotum weakly reticulate or with no sculpture between median setal pair; male pore plate on sternite VIII much smaller, not extending to lateral margins 4
4. Antennal segment VIII lanceolate (Fig. 20), micropterа with IV as yellow as III, but macroptera with IV brown; IV and V of macroptera with numerous sensory hairs ventrally [pronotal am sometimes capitate; male with small sub-circular pore plate on VIII (Fig. 40)] . . . . . ***diaphorus* sp.n.**
-. Antennal segment VIII never lanceolate (Figs 21–30), macroptera without extra sensory hairs on antennal segments IV and V 5

5. Antennal segment V–VI largely yellow (Fig. 28); male unknown . . . . . ***paspalus* sp.n.**
-. Antennal segments V–VI uniformly brown or with V slightly paler at base 6
6. Mid and hind tibiae, also usually antennal segment III, clear yellow 7
-. Mid and hind tibiae, also antennal segment III, brown or at least washed with brown 9
7. Median area of tergites VI–VIII extensively yellow; pronotal am setae longer than discal setae and about 0.5 times as long as aa setae, blunt to weakly capitate (Fig. 4) . . . . . ***regina* sp.n.**
-. Median area of tergites VI–VIII almost uniformly brown; pronotal am setae no larger than discal setae 8
8. Stylets retracted into head half way to po setae (Fig. 10); male sternite VIII with slender transverse pore plate (Fig. 41) . . . . . ***howei* sp.n.**
-. Stylets low in head, wide apart and straight (Fig. 6); male sternite VIII with round pore plate (Fig. 42) . . . . . ***makrus* sp.n.**
9. Tergite IX setae S1 finely acute and longer than tube. . . . . ***minaei* sp.n.**
-. Tergite IX setae S1 capitate, rarely bluntly pointed, less than 0.75 times as long tube 10
10. Male sternite VIII with pore plate strongly transverse, 5–6 times as wide as median length (Fig. 43); both sexes micropterous, but with wing lobe scarcely 20 microns long; antennal segments III and IV each with 2 sense cones . . . . . ***mongai* sp.n.**
-. Male sternite VIII with pore plate transversely oval, less than 2.5 times as wide as median length (Figs 38, 39); if micropterous, then wing lobe at least 50 microns long; frequently with antennal segment III bearing 3 sense cones, and IV with 4 11
11. Maxillary stylets retracted to level of po setae, sub-parallel medially in head and less than one fifth of head width apart (Fig. 13) . . . . . ***deuae* sp.n.**
-. Maxillary stylets less deeply retracted, at least one third of head width apart and not parallel medially (Figs 8, 9) 12
12. Mid and hind tibiae extensively brown; antennal segment III with 3 sense cones, IV with 4; micropterae and macropterae . . . . . ***capitalis* sp.n.**
-. Mid and hind tibiae yellowish, at least on basal third; number of sense cones commonly different; apterae and macropterae 13
13. Both sexes with pronotal am setae acute and scarcely 7 microns long; male sternite VIII pore plate broadly oval (Fig. 38) . . . . . ***chydaeus* sp.n.**
-. Female with pronotal am setae weakly capitate and 15–27 microns long; male sternite VIII pore plate subcircular . . . . . ***norfuki* sp.n.**

***Deplorothrips capitalis* sp.n.**

(Figs 9, 46)

Male microptera: Body legs and antennae brown, tarsi and apices of fore tibiae paler, antennal segment III pale in basal half.

Antennal segment VIII broad at base, IV–VII evenly narrowed to pedicel; III with 3 sense cones, IV with 4 sense cones. Head longer than wide, ocelli small, cheeks with prominent setae; vertex with little or no sculpture except near posterior margin; po setae long and weakly capitate; maxillary pillars less than 50 microns long, stylets retracted more than half way to po setae, about one third of head width apart with faint maxillary bridge (Fig. 9). Pronotum with strong median longitudinal apodeme, without sculpture; am setae minute, remaining setae capitate. Mesonotum with weak transverse lines, lateral setal pair minute, wing lobe small with one capitate seta. Metanotum without sculpture, median setal pair slender and acute. Fore femora stout, fore tarsal tooth about as long as tarsal width, fore tibia with small subapical tubercle (Fig. 9). Prosternal ferna not meeting medially, mesopraesternum eroded to two small sclerites. Pelta broadly hat-shaped, sculpture weak (Fig. 9); tergites II–VII with no sculpture, with 2 pairs of small, straight wing-retaining setae, lateral major setae weakly capitate but not elongate; tergite IX setae S1 capitate, S2 short and pointed. Sternites III–VI with transverse rows of reticulation anterolaterally (Fig. 46), VIII with transversely oval pore plate.

Measurements (holotype male in microns). Body length 1800. Head, length 195; width 160; po setae 57; longest cheek seta 15. Pronotum, length 160; width 230; major setae—am 5, aa 55, ml 35, epim 50, pa 25. Fore wing length 40. Tergite IX setae S1 75, S2 35. Sternite VIII pore plate dimensions 50 x 15. Tube length 100. Antennal segments III–VIII length 60, 57, 55, 45, 42, 25.

Female microptera: Essentially similar to male; fore tarsal tooth slender, fore tibia without subapical tubercle; sternites without reticulate areas or pore plate; tergite IX setae S1 capitate, S2 blunt.

Female macroptera: Similar in colour and structure; fore tarsal tooth slender; fore wing weakly shaded on distal half, with 6 duplicated cilia; tergites II–VII each with two pairs of sigmoid setae.

Material studied. Holotype male microptera, **Australian Capital Territory**, Canberra, Black Mt., from old dead wood, 12.xii.1996 (LAM 3067).

Paratypes (micropterae except as noted): **Australian Capital Territory**, 1 female macroptera, 2 females, 2 males taken with holotype; same site, from *Eucalyptus* dead branches, 2 females, 2 males, 30.iv.2011, 1 male,

6.iii.2011; Canberra, Oakey Hill, 3 female macropterae from dead *Eucalyptus* twigs, 5.iii.2011; Namadji, 6 female macropterae, 1 female, 4 males with larvae on dry *Eucalyptus* branch, 13.ix.2015; 1 female 1 male macropterae, 23.iv.2011; 3 female 1 male macropterae, 3 males, 21.xi.2010.

Comments. The mid and hind tibiae are variable in colour amongst the specimens listed, but are darker than in individuals of the other species. The maxillary levers of many of the specimens examined are rotated, such that the stylets are not in their normal retracted position. Relationships of this species are discussed below under the species *deuae*. One female macroptera has been studied from southern Queensland, Lamington, O'Reillys, that possibly represents this species, but the stylets are disrupted.

***Deplorothrips chydaeus* sp.n.**
(Figs 8, 21, 38)

Male aptera: Body and all femora brown, tibiae and tarsi light brown; mid and hind tibiae yellow in basal third, sometimes yellow at apex; antennal segments I–II light brown, III variably yellow toward base and variably light brown toward apex, IV–VIII darker brown.

Antennal segment VIII broadly joined to VII, IV–VII narrowed to pedicel (Fig. 21); III with two sense cones, IV either with two large sense cones or with one large and two smaller ones. Head longer than wide (Fig. 8), sometimes with one or two weakly developed ocelli, cheeks with weak setae; vertex with no sculpture; po setae long and capitate; maxillary pillars about 50 microns long but with the levers no more than 30 microns, stylets wide apart and retracted half way to po setae. Pronotum with weak median longitudinal apodeme, without sculpture; am setae minute, remaining setae capitate. Mesonotum without sculpture, lateral setal pair minute, no wing lobe. Metanotum without sculpture, median setal pair slender and acute. Fore femora stout, fore tarsal tooth as long as tarsal width, fore tibia with small subapical tubercle. Prosternal ferna not meeting medially, mesopraesternum eroded to two small sclerites and a slender band medially. Pelta eroded, irregularly D-shaped; tergites with no sculpture, II–VII with 2 pairs of very small, straight wing-retaining setae, lateral major setae weakly capitate; tergite IX setae S1 long and capitate, S2 short and pointed. Sternites III–VI often with transverse rows of reticulation anterolaterally, VIII with oval pore plate (Fig. 38).

Measurements (holotype male in microns). Body length 1400. Head, length 160; width 150; po setae 50. Pronotum, length 135; width 190; major setae—am 5, aa 35, ml 20, epim 43, pa 30. Tergite IX setae S1 50, S2 25. Sternite VIII pore plate dimensions 40 x 18. Tube length 85. Antennal segments III–VIII length 45, 47, 47, 40, 40, 23.

Female aptera: similar to male, sense cones on antennal segment IV equally variable; po setae shorter than dorsal eye length; fore tarsal tooth acute, shorter than tarsal width; tergite IX setae S1 and S2 capitate, scarcely longer than basal width of tube.

Female macroptera: similar to male but larger; antennal segments III–IV with sense cones varying in number and sometimes not bilaterally symmetrical, III with 2 or 3, IV with 2 or 4; ocelli well-developed; fore tarsal tooth length about half of tarsal width; fore wing shaded on distal half, with 4 or 5 duplicated cilia and 1 or 2 small capitate sub-basal setae; pelta triangular; tergites each with 2 pairs of sigmoid setae.

Material studied. Holotype male aptera, **New South Wales**, Tallaganda, Lowden Forest Park, from dead *Eucalyptus* branches, 27.ii.2011 (LAM 5431).

Paratypes (apterae except as noted): **New South Wales**, 6 female macropterae, 3 females, 3 males taken with holotype; same site and from dead *Eucalyptus*, 7 males, 2 females, 6.viii.2006; 3 female macropterae,1 male, 12.xi.2006; 7 female macropterae, 2 females, 9.ii.2013; Tinderry Range, 1 female macroptera, 7 females, 5 males from dead branches, 29-30.ii.2013. **Australian Capital Territory**, Mt Ainslie, 2 female macropterae, 5 females, 1 male from dead twigs, 11.vi.1995. **Victoria**, Mallacoota, 2 female macropterae, 1 female, 1 male from *Eucalyptus* dead nuts, 1.iv.2011; Nelson, 1 female from dead *Eucalyptus* nuts, 5.x.2013. **South Australia**, 40km southeast of Mt Gambier, 7 female 2 male macropterae, 5 males, 4 females from *Eucalyptus obliqua* nuts, 12.ii.2011. **Queensland**, Brisbane Forest Park, 2 female macropterae, 3 females, 2 males from dead branches, 3.iv.2011; same locality, 1 female macroptera. 5 females, 2 males on various dates between xi.2007 and iii.2013; Stanthorpe, 3 females, 2 males from dead wood, 28.xii.2011; Girraween, 1 female macroptera, 1 female, 2 males from dead wood, 29.xii.2011.

Comments. This species exhibits confusing variation in several structures. The largest males have the cheek setae more prominent, the fore femora swollen, each fore tibia with a well-developed subapical tubercle, the fore tarsus very stout, and conspicuous reticulate rows on the sternites, whereas each of these characters is more weakly developed or even absent in small males. The number of antennal sense cones varies even within the series taken with the holotype. Macropterae usually have 3 on III and 4 on IV, but some macropterae have only two on both segments, and some apterae have 2 on III but 3 on IV. Moreover, some of the apterae have one or both posterior ocelli weakly developed. Despite the maxillary stylets being retracted into the head half way toward the level of the postocular setae, this species exhibits all of the other character states that are typical of *Deplorothrips*. The tube is relatively short and slightly paler toward the base, and tergite IX setae S1 are scarcely longer than the width of the tube. A series of six females and two males have been studied from Carnarvon Station, Queensland that are essentially similar to this species but have longer setae; po setae 63 microns; S1 on tergite IX 75 microns. A number of specimens of both sexes have been seen from various sites in Tasmania, including Flinders Island, that cannot be placed to species securely. Most, but not all, of the females have the pronotal am setae small and capitate as in *norfuki* from Norfolk Island, but the males have an irregularly transverse oval sternal pore plate as in *chydaeus*, and the macropterae have three sense cones on antennal segment III and four on IV, whereas the apterae have two sense cones on both segments.

***Deplorothrips deuae* sp.n.**
(Figs 13, 18, 22, 39)

Male aptera: Body and all femora brown, tibiae and tarsi light yellowish-brown; antennal segments I–II light brown, III variably yellowish brown, IV–VIII darker brown.

Antennal segment VIII broadly joined to VII (Fig. 22), IV–VII narrowed to pedicel; III and IV each with two sense cones. Head longer than wide (Fig. 13), ocelli absent, cheeks with weak setae; vertex with little or no sculpture except near posterior margin; po setae long and weakly capitate; maxillary pillars about 70 microns long with the levers curving mesad, stylets retracted almost to po setae, subparallel medially and about one third of head width apart with faint maxillary bridge. Pronotum with strong median longitudinal apodeme, without sculpture; am setae minute, remaining setae capitate. Mesonotum with weak transverse lines, lateral setal pair minute, no wing lobe. Metanotum without sculpture, median setal pair slender and acute. Fore femora stout, fore tarsal tooth as long as tarsal width, fore tibia with small subapical tubercle. Prosternal ferna not meeting medially, mesopraesternum eroded to two small sclerites (Fig. 18). Pelta eroded, broadly hat-shaped, weakly reticulate; tergites with no sculpture, II–VII with 2 pairs of very small, straight wing-retaining setae, lateral major setae weakly capitate; tergite IX setae S1 long and capitate, S2 short and pointed. Sternites III–VI with transverse rows of reticulation anterolaterally, VIII with oval pore plate (Fig. 39).

Measurements (holotype male aptera in microns). Body length 1400. Head, length 175; width 150; po setae 60. Pronotum, length 150; width 210; major setae—am 5, aa 50, ml 25, epim 43, pa 43. Tergite IX setae S1 70, S2 30. Sternite VIII pore plate dimensions 40 x 12. Tube length 90. Antennal segments III–VIII length 47, 45, 50, 47, 40, 30.

Female aptera: similar to male but slightly larger, fore tarsal tooth small, pronotum without median longitudinal apodeme (Fig. 13), pelta broadly D-shaped.

Female macroptera: similar to female aptera, antennal segments III and IV each with two sense cones; fore wing with two small sub-basal setae but no duplicated cilia; tergite IX setae S1more than 0.75 as long as tube.

Material studied. Holotype male aptera, **New South Wales**, Batemans Bay, from dead *Casuarina* with lichen, 26.x.1985 (LAM 1932).

Paratypes (apterae except where indicated): **New South Wales**, 8 females, 2 males taken with holotype; Yamba, 2 males from dead wood, 23.xi.2012; Mossy Point, 1 female macroptera from dead wood, 15.ix.2012. **Australian Capital Territory**, Namadji, 1 female, 4 males from dead twigs, 29.viii.2005; same site, 1 male, 18.xii.2005; same site, 1 female macroptera, 2 males from dead twigs with lichen, 27.xii.2005.

Comments. The stylets are more deeply retracted into the head than in any other member of this genus, and there is a distinct maxillary bridge. However, the other characters are shared with species of *Deplorothrips*, indicating that *deuae* is a member of the same lineage and should thus not be segregated to a separate genus. The

type series comprises apterae and two macropterae, whereas the types of *capitalis* comprise micropterae and macropterae. These two species are similar to each other, and there is a possibility that the differences between them are due to the differences in wing morph. Moreover, *deuae* is particularly similar in structure to *minaei*, although that has long pointed major setae. One female and one male micropterae, together with one female macroptera have been studied from Tasmania, Mt. Wellington, that cannot be securely identified because the stylets are disrupted. One male and two female apterae have been studied from South Australia, Meningie, that have stylets as deeply retracted as *deuae*, but have the mid and hind legs and antennal segment III dark brown.

***Deplorothrips diaphorus* sp.n.**
(Figs 2, 20, 40, 47)

Female microptera: Body and femora brown, but tergites VII–VIII pale medially; tibiae and tarsi yellow; antennal segment I brown, II paler at apex, III–V yellow, VI brownish yellow, VII–VIII brown.

Antennal segment VIII constricted to base, lanceolate (Fig. 20); III and IV each with three sense cones; V with 4 sensory hairs (*sensilla trichodea*) ventrally on distal half. Head longer than wide (Fig. 2), ocelli absent, cheeks with two pairs of short setae; vertex weakly sculptured; po setae long and capitate; mouth cone long and pointed, extending between fore coxae; maxillary pillars scarcely 50 microns long with the levers less than 40 microns, stylets wide apart, retracted to just anterior to occipital ridge. Pronotum transverse, without sculpture except at posterior margin; notopleural sutures usually complete but sometimes weakly incomplete; am setae small, remaining setae long and capitate. Mesonotum with weak transverse reticulation, lateral setal pair capitate. Metanotum almost without sculpture, major setal pair acute. Fore tarsal tooth length 0.5 of tarsal width. Wing lobe small with two capitate setae. Prosternal ferna not meeting medially, mesopraesternum eroded to three small sclerites. Pelta broadly hat-shaped; tergites weakly sculptured, II–VII with 2 pairs of small straight wing-retaining setae, lateral major setae long and capitate; lateral setae on tergite VIII, also setae S1 on IX capitate, S2 on IX bluntly pointed.

Measurements (holotype female in microns). Body length 2200. Head, length 210; width 200; po setae 85; longest cheek seta 15. Pronotum, length 190; width 310; major setae—am 15, aa 70, ml 80, epim 83, pa 85. Mesonotal lateral setae 35. Fore wing length 70. Tergite IX setae S1 95, S2 90. Tube length 135. Antennal segments III–VIII length 65, 55, 57, 50, 50, 45.

Male microptera: Essentially similar to female, but antennal segment V brown on apical half; large males with more prominent cheek setae, more robust prothorax and fore legs, and larger fore tarsal tooth; inner apex of fore tibiae thickened but without a tubercle; sternites III–VII anterolaterally usually with narrow transverse band of reticulation (Fig. 47); sternite VIII with small circular to weakly oval pore plate medially, 23 x 17 microns (Fig. 40).

Measurements (large paratype male in microns). Body length 1680. Head, length 200; width 165. Pronotum, length 200; width 300. Tube length 135.

Macropterae (both sexes): Similar to micropterae, except antennal segment V mainly light brown, segments IV–VI with numerous sensory hairs (*sensilla trichodea*) ventrally on distal half, V with about 12 (Fig. 20); fore wing with about 6 duplicated cilia, two sub-basal setae capitate; tergites III–VII with 2 pairs of sigmoid setae; tergite IX setae S1 and S2 both capitate.

Material studied. Holotype female microptera, **Australia**, **Norfolk Island**, Mt Pitt, from dead *Citrus*, 25.x.2013 (LAM 5841).

Paratypes (micropterae except as noted): **Norfolk Island**, 2 female macropterae, 7 females, 7 males taken with holotype; same site and date, 1 male from *Araucaria* litter; same site, 4 female, 5 male macropterae, 4 females, 8 males, 22.xii.2013; Mt Bate, 9 females, 3 males from dead *Citrus*, 30.xi.2914; Summit Track, 1 female macroptera, 6 females, 6 males from dead branch, 25.xi.2014. **Queensland**, Brisbane, Mt Nebo, 2 female macropterae, 8 females, 3 males from dead branch wood, 27.vii.1968 (LAM 788); Mt Glorious, 1 female from dead wood, 11.xi.2009; Lamington, O'Reilly's, 3 female macropterae, 1 female from dead twigs, 9/10.x.2006; Brisbane, 200km north-west, 1 female macroptera, 1 female from bark spray, 8.iii.2015.

Comments. In this species, antennal segment VIII is more constricted basally than in any other member of the genus, including *villosus*. Despite this, *diaphorus* is otherwise typical of the genus in structure, with the stylets

scarcely retracted anterior to the occipital ridge. The antennae are strikingly dimorphic between winged and wingless morphs, both in colour and the presence of extra sensory hairs ventrally on segments IV–VI. In both sexes, macropterae have a group of 10 or more of these small *sensilla trichodea* ventrally on each of antennal segments IV–VI (Fig. 20), although there are only 4 such sensilla in micropterae. All macropterae and micropterae have three major sense cones on segments III and IV. In contrast to the type series from Norfolk Island, most paratype females from the Brisbane area have the pronotal anteromarginal setae capitate and almost half as long as the anteroangular setae.

***Deplorothrips howei* sp.n.**
(Figs 10, 23, 33, 41, 45)

Male microptera: Body and all femora brown, all tibiae and tarsi yellow; antennal segment I brown, II paler at apex, III yellow but weakly shaded at apex, IV with yellow pedicel, V–VIII light brown.

Antennal segment VIII slightly narrower at base than VII at apex (Fig. 23), IV–VII with distinct pedicel; III with 2 (rarely 3) sense cones, IV with 2 or 3 sense cones (left and right antennae of holotype differ). Head scarcely longer than wide (Fig. 10), ocelli absent, cheeks with several weak setae; vertex without sculpture except at posterior margin; po setae long and capitate; maxillary pillars about 45 microns long and the levers about 35 microns, stylets wide apart, retracted into head half-way to level of po setae, with weak maxillary bridge. Pronotum transverse with weak median longitudinal apodeme, without sculpture except at posterior margin; am setae minute, remaining setae capitate. Mesonotum with weak transverse reticulation, lateral setal pair minute. Metanotum without sculpture, median setal pair acute. Fore tarsal tooth as long as tarsal width, fore tibia with stout subapical tubercle (Fig. 45). Wing lobe present, with or without one small capitate seta. Prosternal ferna meeting medially, mesopraesternum eroded to three small sclerites. Pelta D-shaped, weakly sculptured; tergites with no sculpture, II–VII with 2 pairs of very small straight wing-retaining setae, lateral major setae long and capitate; tergite IX setae S1 capitate, S2 short and pointed. Sternites III–V with faint areas of reticulation anterolaterally, VIII with transverse pore plate (Fig. 41). Large males with cheek setae stouter and more numerous, fore femora considerably enlarged, metanotum with a longitudinally sculptured area posterior to a triangular area with no sculpture (Fig. 33), mesoeusternal anterior margin narrow and angulate.

Measurements (holotype male in microns). Body length 1400. Head, length 155; width 145; po setae 70; longest cheek seta 12. Pronotum, length 110; width 190; major setae—am 5, aa 40, ml 35, epim 45, pa 45. Fore wing length 40. Tergite IX setae S1 70, S2 35. Sternite VIII pore plate dimensions 50 x 7. Tube length 90. Antennal segments III–VIII length 45, 43, 45, 40, 35, 25.

Female microptera: similar to male, fore tarsal tooth slender; tergite IX setae S2 long and pointed.

Female macroptera: essentially similar to microptera, except antennal segments III and IV each with three sense cones, fore wings with two capitate sub-basal setae and six duplicated cilia, tergites with two pairs of sigmoid wing-retaining setae.

Material studied. Holotype male microptera, **Lord Howe Island**, Intermediate Hill, from dead branches, 26.xii.2011 (LAM 5545).

Paratypes (micropterae except as noted): **Lord Howe Island**, 1 female macroptera, 1 female, 2 males taken with holotype; Soldiers Creek, 9 females, 4 males, from dead twigs, 21–24.xi.1996; Rocky Run, 2 males from dead branch, 24.xii.2007, 1 male from *Malesia*, 23.xii.2007; Stevens Trail, 1 female macroptera, 3 females, 1 male, 26.xii.2001; Settlement Beach, 2 female macropterae, 22.xii.2001. **New South Wales**, Nowra, 2 females, 2 males from dead twigs, 14.iv.2001; Narooma, 1 male from dead *Eucalyptus* leaves, 28.xii.2010; Crystal Creek, 1 male from dead leaves, 23.xii.2006.

Comments. The stylets of this species, and also of *minaei*, are intermediate in position between the low, wide-apart, V-shaped condition of previously described members of *Deplorothrips* and the deeply retracted condition described here in *capitalis*, *chydaeus* and *retis*. Despite this, *howei* shares most character states with other members of the genus, including antennal segment VIII broad at the base, and in males the presence of a tubercle at the inner apex of the fore tibiae, and a small, transverse pore plate on sternite VIII. This pore plate is broken into two, or even three, segments in a few males, a condition also reported in *Deplorothrips bassus* from New Zealand.

***Deplorothrips makrus* sp.n.**
(Figs 6, 14, 19, 24, 42)

Male aptera: Body and all femora brown, all tibiae and tarsi yellow; antennal segment I brown, II paler at apex, III yellow, IV–V yellow in at least basal third, VI–VIII light brown.

Antennal segment VIII with base broad and scarcely narrower than apex of VII (Fig. 24); IV–VII with narrow pedicel; III and IV each with two sense cones. Head longer than wide (Fig. 6), ocelli absent, cheeks with weak setae ; vertex with little or no sculpture except near posterior margin; po setae long and capitate; maxillary pillars about 50 microns long with the levers curving dorsally and apparently scarcely 30 microns long, stylets wide apart, retracted anterior to occipital ridge. Pronotum relatively long with strong median longitudinal apodeme, without sculpture except at posterior margin; am setae minute, remaining setae capitate. Mesonotum with weak transverse lines, lateral setal pair minute. Metanotum almost without sculpture, median setal pair minute. Fore femora massive, fore tarsal tooth almost as long as tarsal width, fore tibia with pale but stout subapical tubercle. Wing lobe scarcely 5 microns across, with or without one small capitate seta. Prosternal ferna well separated medially (Fig. 19), mesopraesternum eroded to two very small sclerites, mesoeusternal anterior margin transverse. Pelta eroded, broadly hat-shaped; tergites with no sculpture, II–VII with 2 pairs of very small straight wing-retaining setae, lateral major setae long and capitate; tergite IX setae S1 weakly capitate, S2 shorter and blunt. Sternites III–V with faint areas of reticulation anterolaterally, VIII with circular pore plate (Fig. 42).

Measurements (holotype male in microns). Body length 1430. Head, length 175; width 125; po setae 50; longest cheek seta 12. Pronotum, length 180; width 200; major setae—am 5, aa 45, ml 40, epim 50, pa 50. Fore wing length 10. Tergite IX setae S1 60, S2 30. Sternite VIII pore plate dimensions 30 x 20. Tube length 100. Antennal segments III–VIII length 48, 48, 50, 40, 35, 30.

Female aptera: Similar to male, but head less elongate and pronotum more transverse, fore legs more slender with small tarsal tooth; tergite IX setae S1 and S2 long and capitate.

Female macroptera: Similar to female aptera, but antennal segment IV with 3 sense cones and segment III with 2 or 3 sense cones; fore wing pale, weakly narrower medially, with 4 duplicated cilia and 2 capitate sub-basal setae; pelta sub-quadrate; tergites each with 2 pairs of sigmoid wing-retaining setae

Material studied. Holotype male aptera, **Lord Howe Island**, Kim's Lookout, from dead wood with lichens, 22.xii.2001 (LAM 4079).

Paratypes: **Lord Howe Island**, 1 female macroptera, taken with holotype; Stevens Trail, 1 female, 1 male apterae from dead branches, 26.xii.2001. **Queensland**, Lamington, O'Reilly's, 2 female apterae, 1 female macroptera from dead branches, 11.x.2006.

Comments. Although the holotype is considered apterous, it bears a minute wing lobe. It is a large male with expanded fore femora and a large pale tubercle on the tibiae. However, the head has relatively weak cheek setae, but the mouth cone is exceptionally long and pointed, extending between the fore coxae (Fig. 19), although the stylets are not deeply retracted into the head due to the curvature of the maxillary levers. Antennal segment VIII is very weakly constricted at the base (Fig. 24), and the male has a small almost circular pore plate on sternite VIII (Fig. 42). One macropterous female from New Zealand of the *bassus*-complex has been studied that is similar to the *makrus* macropterae but has a shorter mouth cone and most or the major setae with pointed apices.

***Deplorothrips minaei* sp.n.**
(Figs 11, 15, 25)

Male aptera: Body and all femora brown, mid and hind tibiae light brown with tarsi paler; fore tibiae and tarsi brownish-yellow; antennal segments light brown, III paler in basal half.

Antennal segment VIII broad at base, IV–VII narrowed evenly to pedicel (Fig. 25); III with one sense cone, IV with two. Head longer than wide (Fig. 15), ocelli absent, cheeks with weak setae; vertex with little or no sculpture except near posterior margin; po setae long and weakly capitate; maxillary pillars about 55 microns long with the levers curving dorsally and apparently about 40 microns long, stylets retracted almost to po setae, about one third of head width apart with distinct maxillary bridge. Pronotum with strong median longitudinal apodeme, without sculpture; am setae minute, remaining setae weakly capitate. Mesonotum with weak transverse lines, lateral setal

pair minute, no wing lobe. Metanotum without sculpture, median setal pair slender and acute. Fore femora stout, fore tarsal tooth almost as long as tarsal width, fore tibia with small subapical tubercle (Fig. 15). Prosternal ferna almost meeting medially, mesopraesternum eroded to two small sclerites. Pelta eroded, broadly hat-shaped; tergites with no sculpture, II–VII with 2 pairs of very small, straight wing-retaining setae; lateral major setae long and softly pointed but acute on posterior segments; tergite IX setae S1 long and acute, S2 short and pointed. Sternites III–V with faint areas of reticulation anterolaterally, VIII with broadly oval pore plate.

Measurements (holotype male in microns). Body length 1470. Head, length 185; width 145; po setae 65; longest cheek seta 15. Pronotum, length 140; width 210; major setae—am 5, aa 60, ml 50, epim 55, pa 50. Tergite IX setae S1 115, S2 25. Sternite VIII pore plate dimensions 45 x 15. Tube length 90. Antennal segments III–VIII length 45, 48, 50, 48, 45, 25.

Female aptera: similar in structure and colour to male (Fig. 11); fore tarsal tooth shorter, less than half tarsal width; fore tibia with no tubercle; pronotal setae more obviously capitate than in male, pelta more broadly rounded.

Material studied. Holotype male aptera, **Australian Capital Territory**, Black Mt., from dead branch, 2.v.2006 (KM 37).

Paratypes: 4 females taken with holotype; same locality, 1 female from *Melaleuca*, 13.iv.2003.

Comments. Presumably related to *capitalis*, this species is remarkable within *Deplorothrips* for the absence of a sense cone on the inner apex of antennal segment III in both sexes. The maxillary stylets are deeply retracted into the head into a position very similar to that found in *howei*, but the maxillary levers are longer and curve dorsally However, it is distinguished by the long pointed setae on tergite IX, the small oval pore plate on sternite VIII of the male, and the pale brown colour of the hind tibiae and antennal segment III. The holotype is presumably a major male, and smaller males of this species can be expected to have a less robust pronotum. Only one other specimen of *Deplorothrips* has been studied with setae S1 acute on tergite IX, but this female from southern Victoria has these setae much shorter than the tube.

***Deplorothrips mongai* sp.n.**
(Figs 16, 26, 43)

Male microptera: Body and all femora brown, tibiae light brown with tarsi paler, hind tibiae paler on inner distal third; antennal segments light brown, III paler in basal half.

Antennal segment VIII broad at base but slightly narrower than apex of VII (Fig. 26); IV–VII with narrow pedicel; III and IV each with two sense cones. Head longer than wide (Fig. 16), ocelli absent, cheeks with weak setae; vertex with little or no sculpture except near posterior margin; po setae long and capitate; maxillary pillars scarcely 30 microns long with the levers short and sharply curved mesad and dorsally, stylets wide apart, retracted scarcely one third of distance to level of po setae. Pronotum with strong median longitudinal apodeme, without sculpture; am setae minute, remaining setae capitate. Mesonotum almost without sculpture, lateral setal pair minute, wing lobe small with one or two small setae that are sometimes capitate. Metanotum without sculpture, median setal pair slender and acute. Fore femora stout, fore tarsal tooth almost as long as tarsal width, fore tibia with subapical tubercle. Prosternal ferna almost meeting medially, mesopraesternum eroded to two small sclerites. Pelta eroded, wider than long, weakly sculptured; tergites with no sculpture, II–VII with 2 pairs of very small, straight wing-retaining setae, lateral major setae capitate; tergite IX setae S1 weakly capitate, S2 short and pointed. Sternites IV–VI with faint areas of reticulation anterolaterally, VIII with transverse pore plate (Fig. 43).

Measurements (holotype male in microns). Body length 1230. Head, length 150; width 130; po setae 40; longest cheek seta 12. Pronotum, length 140; width 175; major setae—am 5, aa 35, ml 35, epim 35, pa 35. Fore wing length 18. Tergite IX setae S1 35, S2 25. Sternite VIII pore plate dimensions 75 x 15. Tube length 85. Antennal segments III–VIII length 43, 40, 45, 38, 35, 25.

Female microptera: Similar to male apart from secondary sexual characters; slightly larger, with fore tarsal tooth smaller.

Material studied. Holotype male microptera, **New South Wales**, Monga Forest, from dead branch, 24.i.2013 (LAM 5733).

Paratypes: 5 males, 16 females taken with holotype.

Comments. This species is closely similar to *chydaeus*, but has shorter antennae and sternite VIII of the male has a transversely elongate pore plate. Although described here as micropterous, the specimens have the wing lobe scarcely 20 microns long. A sample of both sexes from *Eucalyptus* dead branches and nuts, Tasmania, 17 Mile Plain, is closely similar to the type series, but has the wing lobe up to 35 microns long, and the tube and tergite IX setae also longer.

***Deplorothrips norfuki* sp.n.**
(Figs 7, 27, 37)

Male aptera: Body and all femora brown, mid and hind tibiae yellowish brown with apex pale, tarsi yellow; antennal segment I brown, II paler at apex, III variably yellow toward base but variably light brown toward apex, IV–VIII dark brown.

Antennal segment VIII slightly narrower at base than VII at apex, IV–VII sharply narrowed to pedicel (Fig. 27); III and IV each with two large sense cones. Head longer than wide, posterior ocelli weakly developed, cheeks with weak setae; vertex with sculpture near posterior margin; po setae long and capitate; maxillary stylets wide apart, retracted anterior to occipital ridge (Fig. 7). Pronotum with median longitudinal apodeme, without sculpture; am setae minute, remaining setae capitate with ml setae shortest. Mesonotum with transverse sculpture, lateral setal pair short but capitate, wing lobe minute. Metanotum without sculpture medially but with weak longitudinal ridges on posterior third (Fig. 37), median setal pair slender and acute. Fore femora and fore tarsal tooth stout, fore tibia with small subapical tubercle. Prosternal ferna almost meeting medially, mesopraesternum eroded to three small sclerites, mesoeusternal anterior margin narrow and convex. Pelta hat-shaped, weakly sculptured; tergites with no sculpture, II–VII with 2 pairs of very small, straight wing-retaining setae, lateral major setae weakly capitate but lateral pair on IV–VII acute; tergite IX setae S1 long and capitate, S2 short and pointed. Sternites II–VI with transverse rows of reticulation anterolaterally; VIII with small, almost circular, pore plate.

Measurements (holotype male in microns). Body length 1720. Head, length 170; width 145; po setae 60; longest cheek seta 12. Pronotum, length 170; width 235; major setae—am 5, aa 60, ml 25, epim 50, pa 45. Fore wing lobe 7. Tergite IX setae S1 65, S2 30. Sternite VIII pore plate dimensions 20 x 16. Tube length 100. Antennal segments III–VIII length 50, 45, 50, 40, 40, 30.

Female aptera: similar to male but larger, fore tarsal tooth smaller and more pointed; pronotal am setae weakly capitate; metanotum without longitudinal ridges on posterior half; tergite IX setae S2 long and softly pointed.

Measurements (paratype female aptera in microns). Body length 1730. Head, length 170; width 155. Pronotum, length 130; width 210; major setae—am 27/15, aa 35, ml 35, epim 50, pa 45. Tergite IX setae S1 85, S2 85. Tube length 100.

Female macroptera: similar to female aptera, ocelli well developed, tergites with two pairs of sigmoid setae; fore wing with 2 capitate sub-basal setae and 5 duplicated cilia.

Material studied. Holotype male aptera, **Australia**, **Norfolk Island**, Palm grove Track, from old dead branch, 23.xii.2012 (LAM5703).

Paratypes (apterae except as indicated): **Norfolk Island**, 1 male, 2 females taken with holotype; same locality, 2 males from *Cordyline* leaf litter, 21.x.2013, same locality, 2 males from dead branches, 30.xi.2014; Prince Philip Drive, 2 males 2 females from *Toona* dead branch, 25.xii.2012; Bird Rock Track, 1 male from dead branch, 22.xi.2014; Mission Road Forest, 1 female macroptera from dead branches, 27.iii.2014.

Comments. Although similar to *chydaeus*, this species from Norfolk Island has the maxillary stylets slightly less retracted into the head. The females have capitate pronotal anteromarginal setae, and the males have sternite VIII with a smaller, almost circular, pore plate. Two female macropterae have been studied from coastal New South Wales (Broulee and Nowra) that possibly also represent *norfuki*.

***Deplorothrips paspalus* sp.n.**
(Figs 3, 28)

Female microptera: Antennal segments III–VI yellow in basal half but each with apex brown (Fig. 28); body and

antennal segments I–II and VII–VIII light brown, tube darkest; femora light brown, with apices yellow; tibiae yellow but washed with very faint light brown, tarsi yellow.

Antennal segment VIII very broad at base, IV–VII with narrow pedicel (Fig. 28); III with three sense cones, IV with four. Head slightly longer than wide, ocelli absent, cheeks with weak setae; vertex without sculpture except near posterior margin; po setae long and pointed; maxillary pillars about 40 microns long with the levers scarcely 30 microns, stylets wide apart, retracted to just anterior to occipital ridge (Fig. 3). Pronotum transverse, without sculpture except at posterior margin; am setae minute, epim weakly capitate, remaining setae pointed. Mesonotum transversely reticulate, lateral setal pair minute. Wing lobe small with one seta. Metanotum almost without sculpture, major setal pair small and acute (Fig. 3). Fore tarsal tooth length less than 0.5 of tarsal width. Prosternal ferna not meeting medially, mesopraesternum eroded to two very small sclerites. Pelta small, broadly D-shaped, anterior margin eroded; tergites with no sculpture, II–VII with 2 pairs of small straight wing-retaining setae; both pairs of lateral major setae long and acute; tergite VIII setae S1 and S2, also setae S1 on IX weakly capitate, S2 on IX shorter and pointed.

Measurements (holotype female microptera in microns). Body length 1600. Head, length 170; width 145; po setae 65; longest cheek seta 10. Pronotum, length 135; width 210; major setae—am 5, aa 35, ml 45, epim 50, pa 55. Fore wing lobe 35. Tergite IX setae S1 70, S2 40. Tube length 95. Antennal segments III–VIII length 45, 45, 45, 43, 40, 25.

Female macroptera: Similar to microptera, but ocelli present; mesonotal lateral setae acute, 15 microns long; metanotum without sculpture anteromedially but reticulate on posterior half; fore wing sub-basal setae blunt to pointed, 4–6 duplicated cilia; tergal wing-retaining setae sigmoid.

Material studied. Holotype female microptera, **Australia**, **Norfolk Island**, Mission Road Forest, from dead branches, 27.iii.2014 (LAM 5954).

Paratype: **Norfolk Island**, Palm Glen, 1 female macroptera from dead *Citrus*, 24.iii.2014.

Comments. Known only from two specimens taken at widely separated sites on Norfolk Island this species is typical of the genus in having antennal segment VIII broadly joined to VII, and the maxillary stylets scarcely retracted anterior to the occipital ridge. However, it is unique in the genus for the pale colour of the antennae, including segment VI, and is also unusual in having most of the major setae with acute, not capitate, apices, and setae S2 on tergite IX of females unusually short and more like S2 setae of males in this genus.

***Deplorothrips regina* sp.n.**
(Figs 4, 29. 34)

Female microptera: Body and femora brown, tergites VI–VIII yellow medially; tibiae and tarsi clear yellow; antennal segment I–II and IV–VIII brown, III yellow, IV pale at base.

Antennal segment VIII slightly constricted at base (Fig. 29), IV–VII with narrow pedicel; III and IV each with three sense cones. Head longer than wide, ocelli absent, cheeks with weak setae (Fig. 4); vertex weakly sculptured; po setae long and capitate; maxillary pillars short, about 35 microns with the levers even shorter and curving dorsally, stylets wide apart, retracted anterior to occipital ridge. Pronotum transverse, without sculpture except near posterior margin; major setae capitate, am setae scarcely 0.5 as long as aa setae. Mesonotum transversely reticulate, lateral setae capitate. Metanotum without sculpture medially (Fig. 34), major setae acute. Fore tarsal tooth shorter than 0.5 of tarsal width. Fore wing lobe with two capitate setae. Prosternal ferna almost meeting medially, mesopraesternum eroded to three small sclerites. Pelta sub-quadrate and reticulate (Fig. 34); tergites III–VII with no sculpture medially, with 2 pairs of small straight wing-retaining setae, lateral major setae long and capitate; setae S1 and S2 on IX long and capitate.

Measurements (holotype female microptera in microns). Body length 1710. Head, length 185; width 160; po setae 55; longest cheek seta 10. Pronotum, length 130; width 230; major setae—am 27, aa 55, ml 50, epim 55, pa 45. Mesonotal lateral seta 35. Fore wing lobe 50. Tergite IX setae S1 80, S2 75. Tube length 110. Antennal segments III–VIII length 52, 50, 52, 45, 45, 33.

Material studied. Holotype female microptera, **Queensland**, Brisbane, Buhot Creek Reserve, from barkspray, 27.vi.2011 (Monteith & Turco; DJT 1297).

Paratypes: **Queensland**, one female taken with holotype; West of Cooktown, Melody Rocks, 2 females from

barkspray in rainforest, 9.xi.2014; Brisbane, Mt. Glorious, 1 female from dead branch, 19.i.2006; Lamington, O'Reillys, 1 female from dead leaves, 9.x.2006.

Comments. Although known only from six females, the pale colour of their abdominal tergites is distinctive, and the sculpture on the pelta is almost uniformly reticulate. The pronotal anteromarginal setae are minute in the last two listed paratypes, but are longer in the other four specimens and varying from blunt to capitate.

***Deplorothrips retis* sp.n.**
(Figs 12, 30, 35)

Male macroptera: Body and legs dark brown with red internal pigment, but fore tarsi paler; antennal segment III brownish-yellow with apex darker, IV–VI pale in basal third; major setae pale except po and pronotal aa, ml and pa that are dark; fore wing weakly shaded.

Antennal segment VIII broad at base, IV–VII with narrow pedicel (Fig. 30); III and IV each with two sense cones. Head longer than wide, cheeks with weak setae; vertex reticulate, po setae scarcely reaching posterior margin of eyes; maxillary stylets retracted to just anterior to po setae, less than one-fifth of head width apart (Fig. 12). Pronotum transverse, surface very weakly reticulate; major setae all small. Mesonotum transversely reticulate, lateral setal pair small. Metanotum reticulate (Fig. 35), major setal pair pointed. Fore tarsal tooth length about 0.5 of tarsal width; apex of fore tibia with no tubercle. Fore wing broad, narrowing to apex, with about 10 duplicated cilia, sub-basal setae short. Prosternal ferna almost meeting medially, mesopraesternum eroded to 3 sclerites. Pelta reticulate (Fig. 35); tergites reticulate, II–VII with 2 pairs of sigmoid setae, lateral major setae weakly capitate; tergite IX setae S1 with apex blunt, S2 short and blunt. Sternite VIII with narrow transverse pore plate extending fully across sternite to lateral margins.

Measurements (holotype male macroptera in microns). Body length 2050. Head, length 210; width 195; po setae 25; longest cheek seta 10. Pronotum, length 150; width 280; major setae—am 5, aa 20, ml 20, epim 45, pa 30. Mesonotal lateral seta 10. Fore wing length 730. Tergite IX setae S1 120, S2 35. Sternite VIII pore plate dimensions 130 x 10. Tube length 180. Antennal segments III–VIII length 55, 50, 55, 50, 50, 25.

Male microptera: very similar in structure to macroptera, but metathorax broader; fore wing shorter than thorax width, with three sub-basal setae.

Female microptera: similar in structure to male microptera, tergite IX setae S1 and S2 long with apices blunt.

Material studied. Holotype male macroptera, **South Australia**, 20km north of Meningie, from a lichen, *Xanthoria parietina*, 15.i.2002 (LAM 4101/2).

Paratypes: 1 female, 3 male micropterae collected with holotype.

Comments. This species is possibly not closely related to the other species of *Deplorothrips*. It is one of two species placed in this genus that have the stylets deeply retracted and only one third of the head width apart. In contrast to the second species, *deuae*, the available specimens are not sufficiently cleared to measure the length of the maxillary pillars, but they seem to be about 70 microns long, with long maxillary levers. It is the only species considered here that has the postocular setae and three of the pronotal major setal pairs dark in colour, the fore wing is shaded and bears 10 duplicated cilia, and the postocular setae are unusually short. In general appearance it is similar to *Trichothrips connexus* Hood, from Australia, a species that lacks duplicated cilia on the fore wings and is currently listed under *Hoplothrips*. However, neither *connexus* nor *retis* can be considered as closely related to *corticis* DeGeer, the type species of *Hoplothrips*.

***Deplorothrips villosus* sp.n.**
(Figs 1, 17, 32, 36, 44)

Female aptera: Body and femora brown, tube darkest, all tibiae and tarsi yellow, antennal segment III yellow in basal half, IV in basal third, V only at base, remaining segments brown.

Antennal segment VIII constricted at base (Fig. 32), III and IV each with 3 sense cones but ventrolateral one smaller than other two. Head slightly longer than wide, without ocelli, reticulate at least on posterior half (Fig. 1); cheeks with 2 or 3 small stout setae; po setae long and capitate; mouth cone pointed; maxillary pillars less than 30 microns long with the levers also very short, maxillary stylets not retracted anterior to occipital ridge, mandible

small. Pronotum transverse, weakly reticulate around margins, notopleural sutures not always fully complete, all 5 pairs of major setae capitate, but am setae short. Mesonotum transversely reticulate, lateral setal pair capitate; wing lobe minute, sometimes with one capitate seta. Metanotum transverse, finely reticulate, major setal pair capitate, 6 to 10 minor setae scattered anteromedially (Fig. 1). Fore tarsus with tooth. Prosternal ferna almost meeting medially, mesopraesternum eroded to 3 sclerites. Pelta broadly rounded, reticulate; tergites with 2 pairs of small straight wing-retaining setae; setae S1 and S2 on IX capitate.

Measurements (holotype female aptera in microns). Body length 1930. Head, length 190; width 160; po setae 50; longest cheek seta 15. Pronotum, length 150; width 230; major setae—am 20, aa 35, ml 40, epim 45, pa 40. Mesonotal lateral seta 30. Fore wing lobe 5. Tergite IX setae S1 60, S2 60. Tube length 120. Antennal segments III–VIII length 57, 55, 53, 45, 40, 30.

Male aptera: Small male—similar to female, but sense cones on antennal segments III and IV variable from 2 to 3; pronotal am setae no larger than discal setae; tergite IX setae S2 short and stout; sternite VIII with broad pore plate (Fig. 44). Large male—with head bearing 6 or more stout cheek setae (Fig. 17); small tubercle present ventrally between eyes; pronotum almost as long as wide, aa and ml setae elongate, pa setae small and pointed; metanotum elevated medially into broadly rounded tubercle (Fig. 36); fore femora and fore tarsal tooth large, fore tibia inner apex thickened but not produced into a tubercle; sternites II–VI with paired transverse rows of specialised reticulation, VIII with broad pore plate (Fig. 44).

Measurements (paratype large male aptera in microns). Body length 2100. Head, length 240; width 160; po setae 75; longest cheek seta 20. Pronotum, length 270; width 300; major setae—am 5, aa 100, ml 100, epim 70, pa 20. Mesonotal lateral seta 20. Fore wing lobe 10. Tergite IX setae S1 75, S2 35. Sternite VIII pore plate dimensions 110 x 30. Tube length 130. Antennal segments III–VIII length 65, 70, 65, 60, 45, 35.

Female macroptera: Similar to female aptera, but ocelli present, antennal segment IV with 4 large sense cones, metanotum more elongate; fore wing with 2 capitate sub-basal setae and 12 duplicated cilia, tergites II–VII each with 2 pairs of sigmoid wing-retaining setae.

Male macroptera: Similar to male aptera, but ocelli present, antennal segment IV with 4 large sense cones, pronotal am setae no larger than discal setae, metanotum more elongate; fore wing with 2 capitate sub-basal setae and 12 duplicated cilia, tergites II–VII each with 2 pairs of sigmoid wing-retaining setae.

Material studied. Holotype female aptera, **South Australia**, 40km SE of Mt Gambier, from *Eucalyptus obliqua* nuts, 12.iii.2011 (LAM5465).

Paratypes (all apterae except as noted): **South Australia**, 6 females, 6 males; 1 female, 1 male macropterae taken with holotype. **Norfolk Island**, Palm Grove track, 6 females, 1 male from dead twigs, 22.xii.2012. **Queensland**, Brisbane, Mt Glorious, from dead leaves and branches, 1 female, 2 males, 1female, 1 male macropterae, 22.iii.2007; Lamington, O'Reilly's, 1 male, 1 female macroptera, i.2008; from dead wood, 1 female, 7.viii.2013, 1 female, 13.iii.2007; Cape Tribulation, 1 female from dead leaves, 7.x.2012. **Tasmania**, Huon Valley, 1 male macroptera, 29.v.2001. **Western Australia**, 40km N of Albany, fogging *Eucalyptus* tree, 2 females, 1 male, v.2001.

Comments. This species differs from other members of the genus as follows: maxillary pillars exceptionally short and stylets not extending anterior to the occipital ridge, antennal segment VIII weakly constricted at base, metanotum with small discal setae antero-medially, and male sternite VIII with broad pore plate (Fig. 44). However, as discussed above, each of these character states varies amongst the Australian species considered here. The number of sense cones on the fourth antennal segments varies between apterae and macropterae, and the largest males have the metanotum elevated into a crest although their fore tibiae do not have a tubercle at the inner apex. The specimens from Norfolk Island, also one female from Queensland, Lamington, have the tibiae with brown shading medially. Three females from Brisbane, Mt Glorious, have been studied with the metanotum similar to *villosus*, but with the hind tibiae uniformly brown, and the maxillary stylets retracted into the head at least half way to the post ocular setae.

Deplorothrips virgulatus **sp.n.**

(Figs 5, 31)

Female aptera: Body and femora light brown, tube darkest, head yellow between eyes; all tarsi and tibiae yellow, antennal segments I and II light brown, III yellow in basal half, IV–VIII dark brown.

Antennal segment VIII broadly joined to VII (Fig. 31), only 2 sense cones on each of III and IV. Head slightly longer than wide (cf. Fig. 5), without ocelli or reticulation; cheeks with one pair of small stout setae; po setae long and capitate; mouth cone rounded; maxillary pillars slender and about 40 microns long, maxillary levers rotated medially, stylets retracted anterior to occipital ridge. Pronotum transverse, without sculpture, major setae capitate, although am setae short. Mesonotum with weak transverse reticulation, lateral setal pair capitate. Metanotum without sculpture on anterior half, with longitudinal sculptured ridges on posterior half, major setal pair finely pointed. Fore tarsus with small tooth. Prosternal ferna not meeting medially, mesopraesternum eroded to 2 sclerites. Pelta broadly rounded, sculpture faint; tergites with 2 pairs of small straight wing-retaining setae; setae S1 and S2 on IX weakly capitate.

Measurements (holotype female aptera in microns). Body length 1350. Head, length 150; width 130; po setae 40. Pronotum, length 100; width 190; major setae—am 10, aa 20, ml 20, epim 25, pa 25. Mesonotal lateral seta 20. Tergite IX setae S1 65, S2 75. Tube length 90. Antennal segments III–VIII length 40, 38, 40, 35, 35, 25.

Male aptera: Small male similar to female; large male with larger fore tarsal tooth and fore tibia with tubercle on inner apex; metanotum more strongly sculptured, posterior ocelli weakly developed (Fig. 5); tergite IX setae S2 short and stout; sternite VIII without a pore plate, but III–V laterally with paired transverse rows of specialised reticulation.

Material studied. Holotype female aptera, **Northern Territory**, Darwin, Holmes Jungle, from dead branches, 8.v.2014 (LAM6014).

Paratypes: 2 male apterae taken with holotype.

Comments. As indicated in the key, the colour of the head is unique in this species, and the male has no pore plate on sternite VIII. The longitudinal sculpture on the metanotum is more strongly developed in the large male (Fig. 5) than in the smaller male and female holotype. Similar but weaker sculpture has been noted on the metanotum in large males of *norfuki* from Norfolk Island. Apart from this, *virgulatus* is a typical member of the genus, with the stylets scarcely retracted anterior to the occipital ridge, and the fore tibiae of males with a small tubercle on the inner apex.

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